

Updates on TCMT Software and TB data analysis (noise studies)

Guilherme Lima, Vishnu Zutshi



NORTHERN ILLINOIS
UNIVERSITY

Analysis & Software phone meeting
September 27, 2007

Checks to TCMT reconstruction

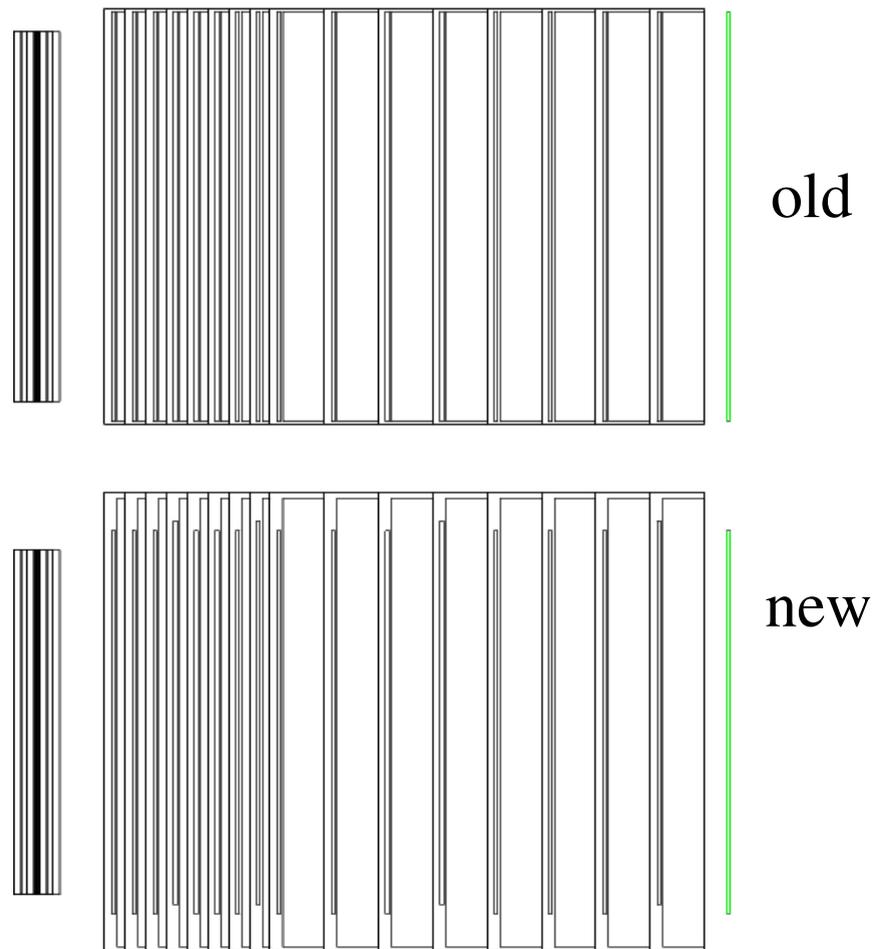
- Fine tune TCMT z-position against simulations

	Mokka simulations				Marlin reconstruction		
	Aug.06	Oct.06	July07		Aug.06	Oct.06	July07
first TCMT layer at z	3402mm	3413mm				3413mm	
last HCAL layer at z	2530mm	3227mm				3233mm	
Distance interval	872mm	186mm				180mm	
first Ecal layer at z	764.3mm	2059mm				2058mm	
last Ecal layer at z	958.3mm	2253mm				2252mm	

- For Aug06, no MIP calib DB folder yet available (low priority)
 - For July07, no simulation model available yet
- TCMT software is ready for reprocessing of July07 data
(Will the Oct'06 data be reprocessed? If so, when?)

Mokka: TCMT model for TBCern07

- New Mokka driver TBcatcher06 is ready for simulations of July'07 running period at CERN
 - Staggering of TCMT modules (**hardcoded!**):
 - For horizontal strips:
 - layers 2,6,10,14: nominal (y_{nom})
 - layers 4,8,12,16: $y' = y_{nom} + 2.54\text{cm}$
 - for vertical strips:
 - layers 1,5,9,13: nominal (x_{nom})
 - layers 3,7,11,15: $x' = x_{nom} + 2.54\text{cm}$
 - Absorbers have been enlarged



TCMT side views

JAS3 for Calice event display

reco-Run300658.000.slcio

File Edit View Tuple Loop LCD Window Help

Interaction Picking Settings Cuts

Interaction

Types

- DetectorType
- EventType
 - driftchamber_track
 - TcmCalorimeter_Hits
 - EmcCalorimeter_Hits
 - AhcCalorimeter_Hits
- axis
 - xaxis
 - yaxis
 - zaxis

Instances

- Detector
- Event

Apply immediately Apply

Hide Types below level: 2

Hide Instances below level: 2

JAS3Tree x WIRED x

LCIO Event Header

LCIO Event Header	
Run	300658
Event	1014
Time Stamp	Thu Oct 19 19:34:32 CDT 2006
Detector Name	unknown
Collections	

View 1

View 2

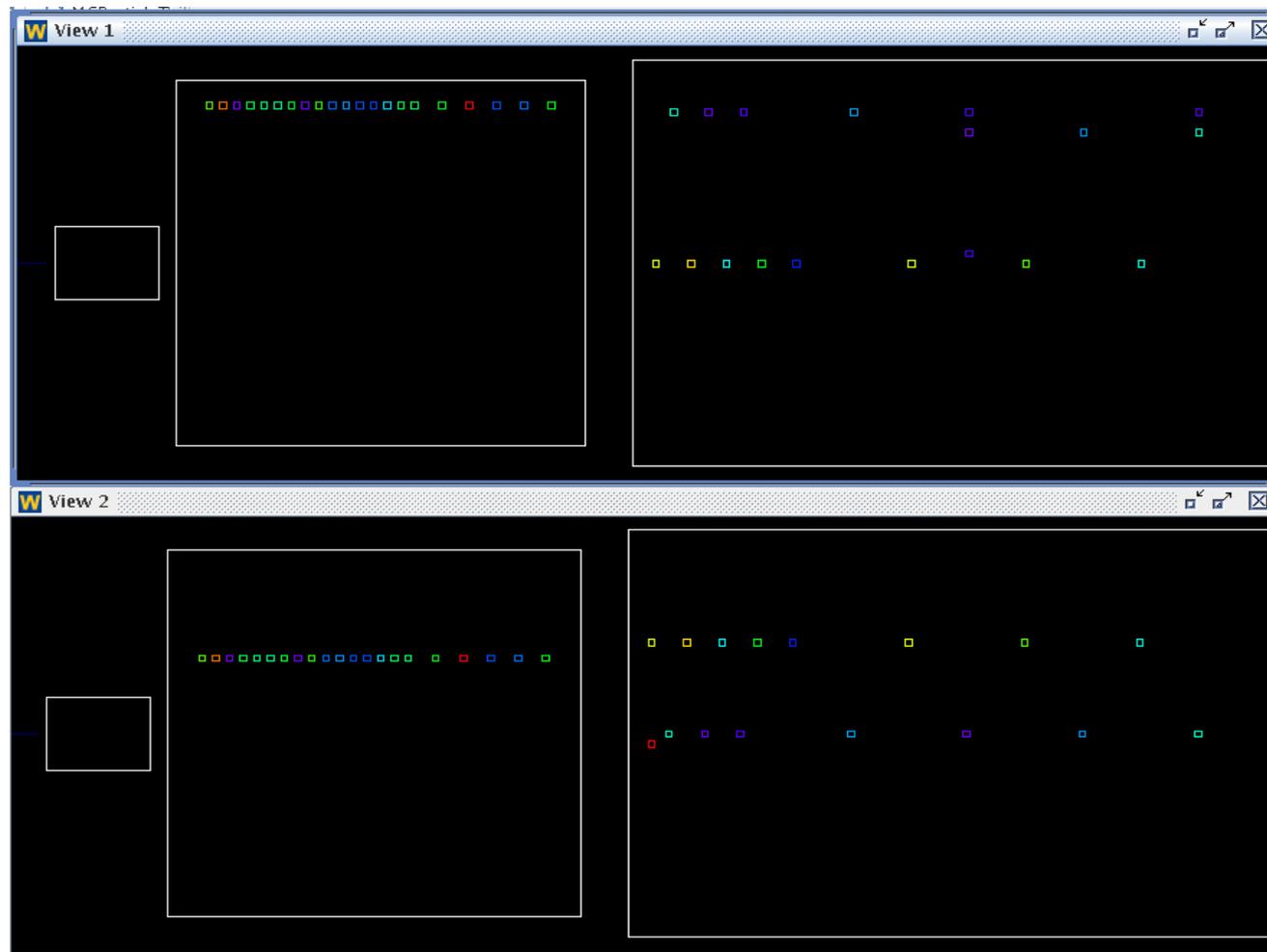
Real showers: 20 GeV pion

Analyzed 1 records in 3ms

15.4/74.4MB

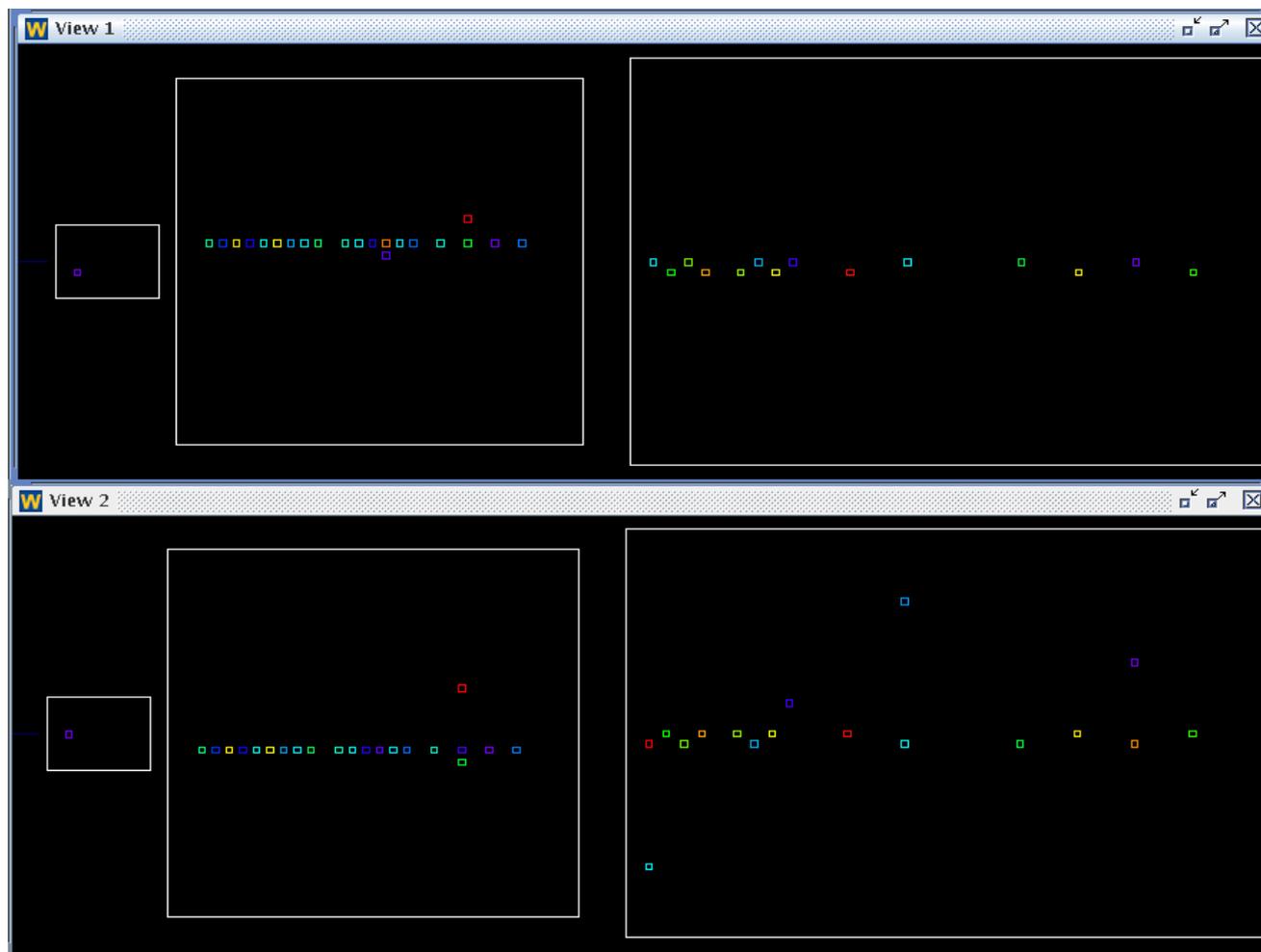
Using the event display for coarse alignment

- Note that TCMT hits are strips rather than square cells.
- I have contacted JAS3 developers about how to draw strips for TCMT hits



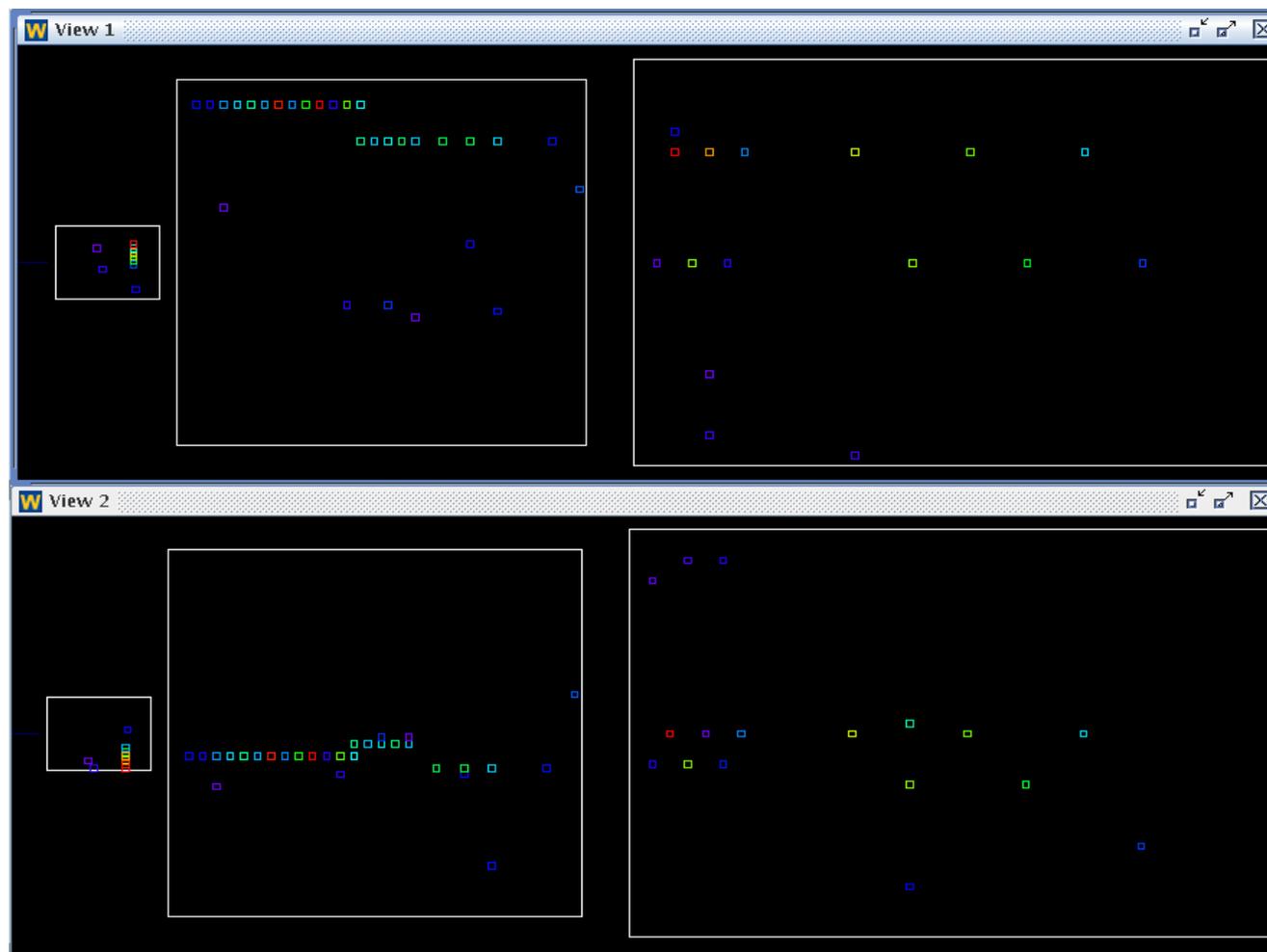
Using event display to search for problems

- This event seems to be missing Emc hits



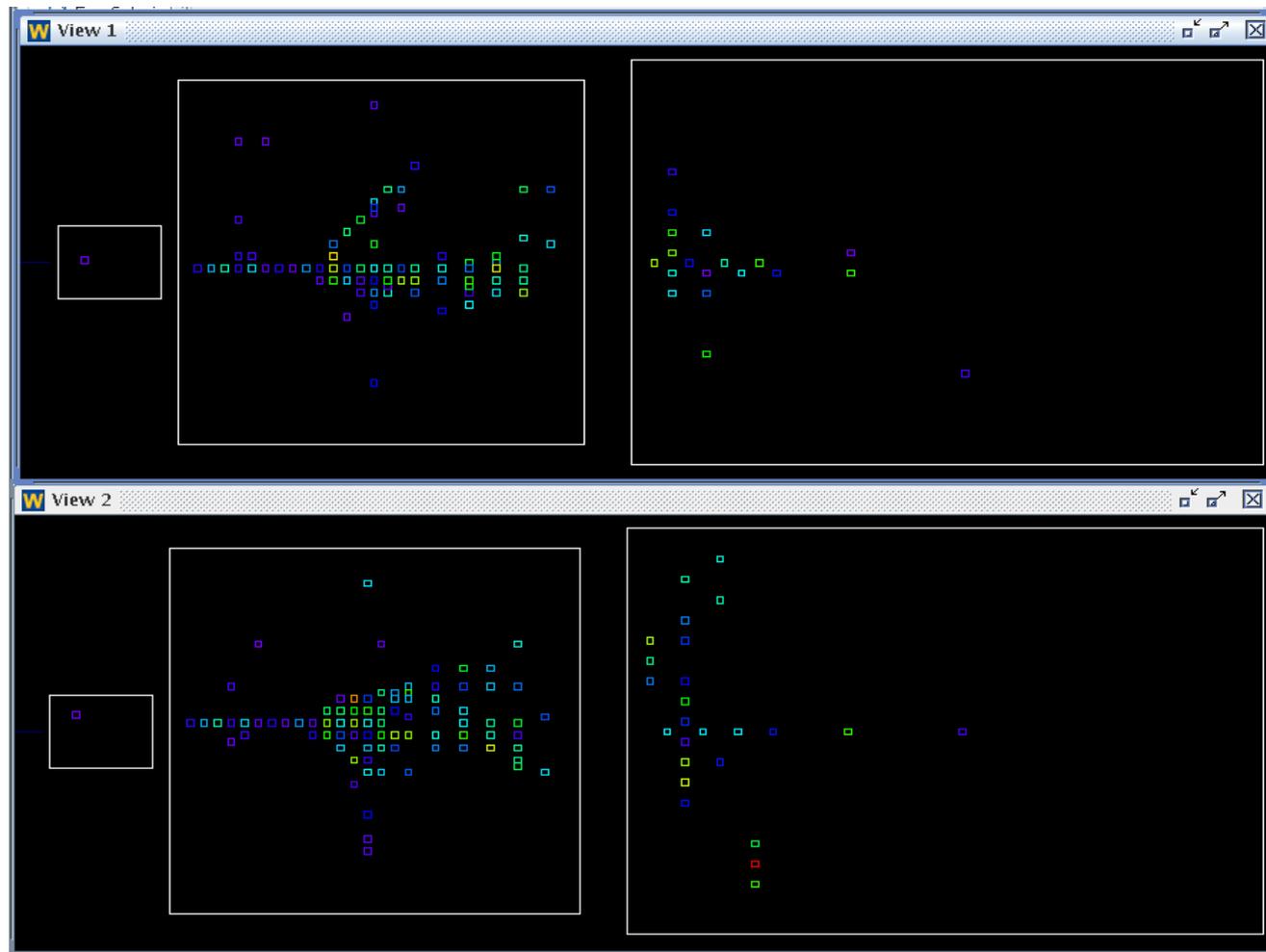
Using event display to search for problems

- Noisy Emc



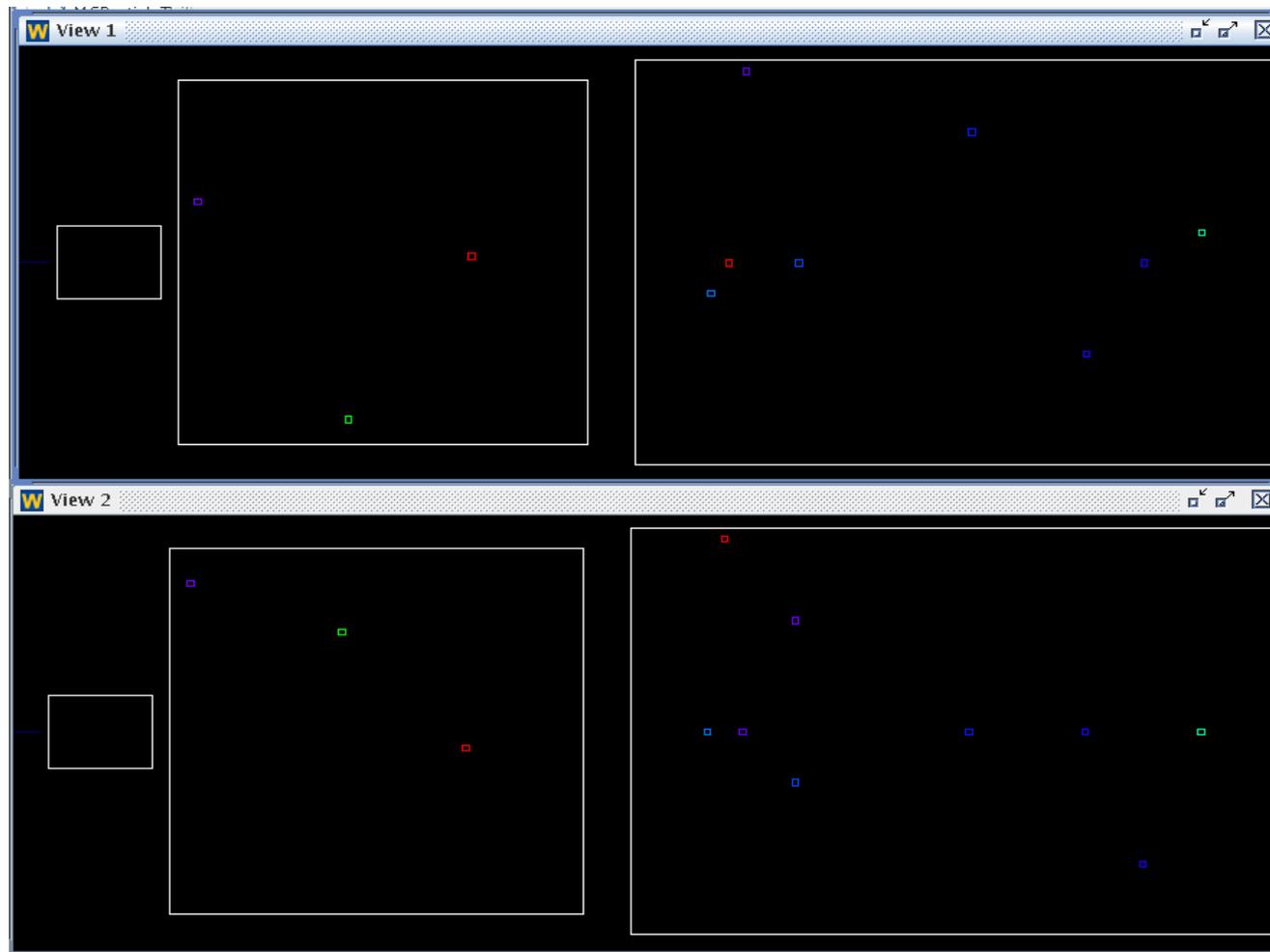
Using event display to search for problems

- Another Emc miss

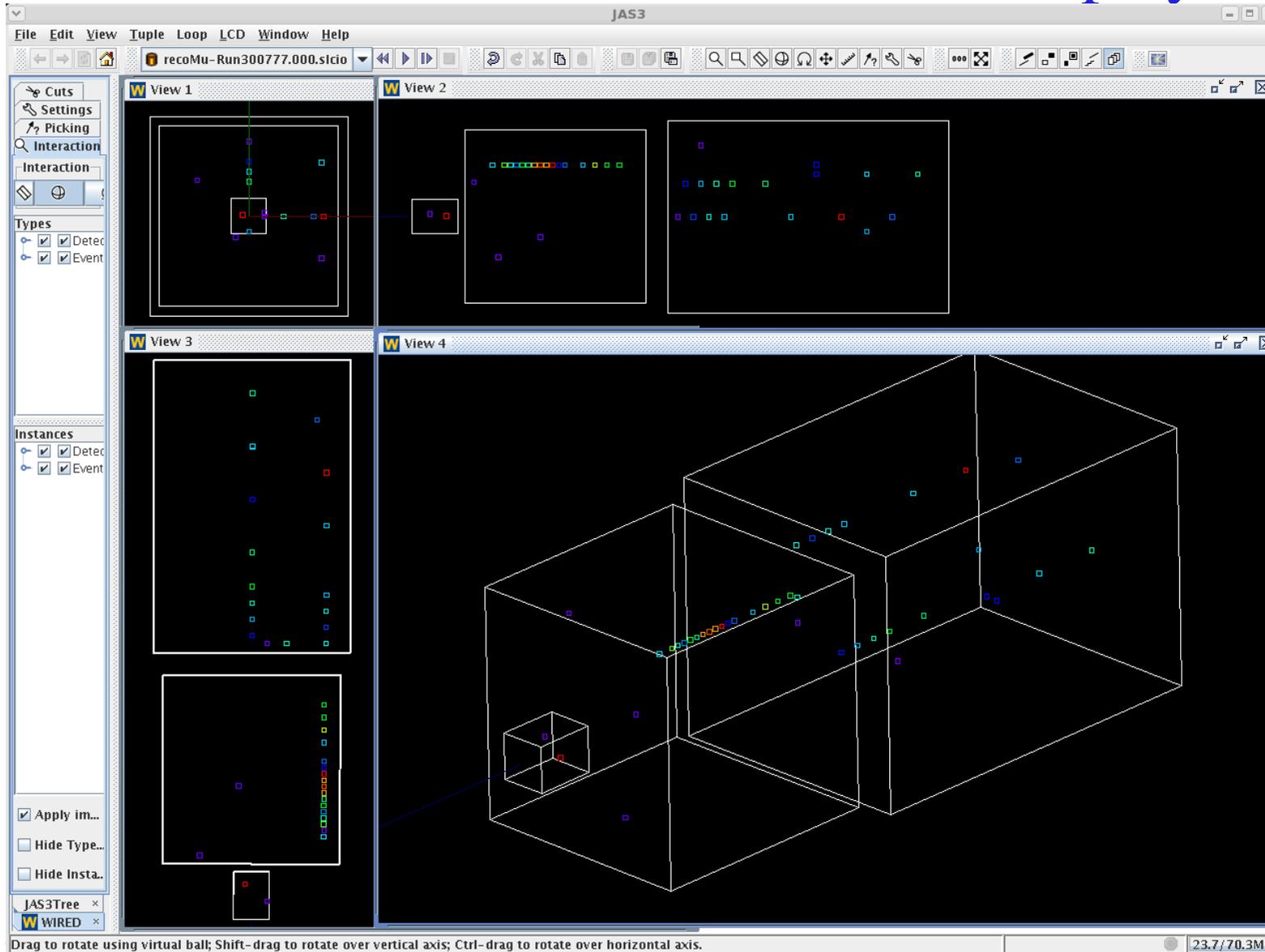


Using event display to search for problems

- Hcal and TCMT noise



JAS3 for Calice event display



- Note that TCMT hits are strips rather than square tiles.

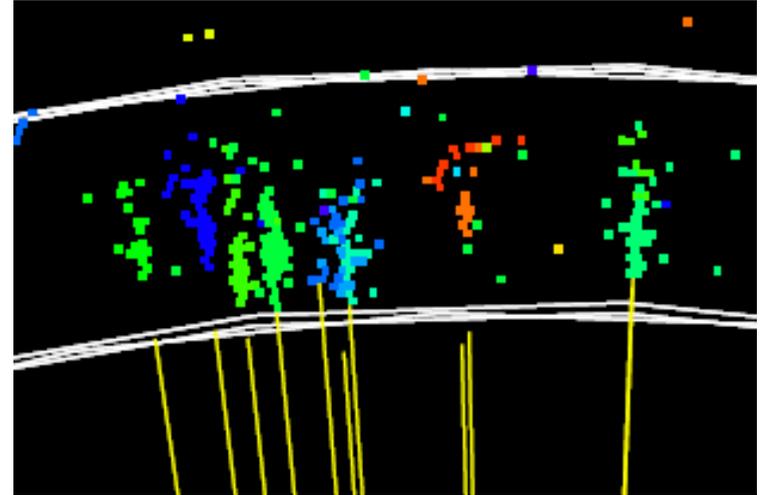
Directed tree clustering algorithm

- Cal-only clustering developed at NIU (V.Zutshi):

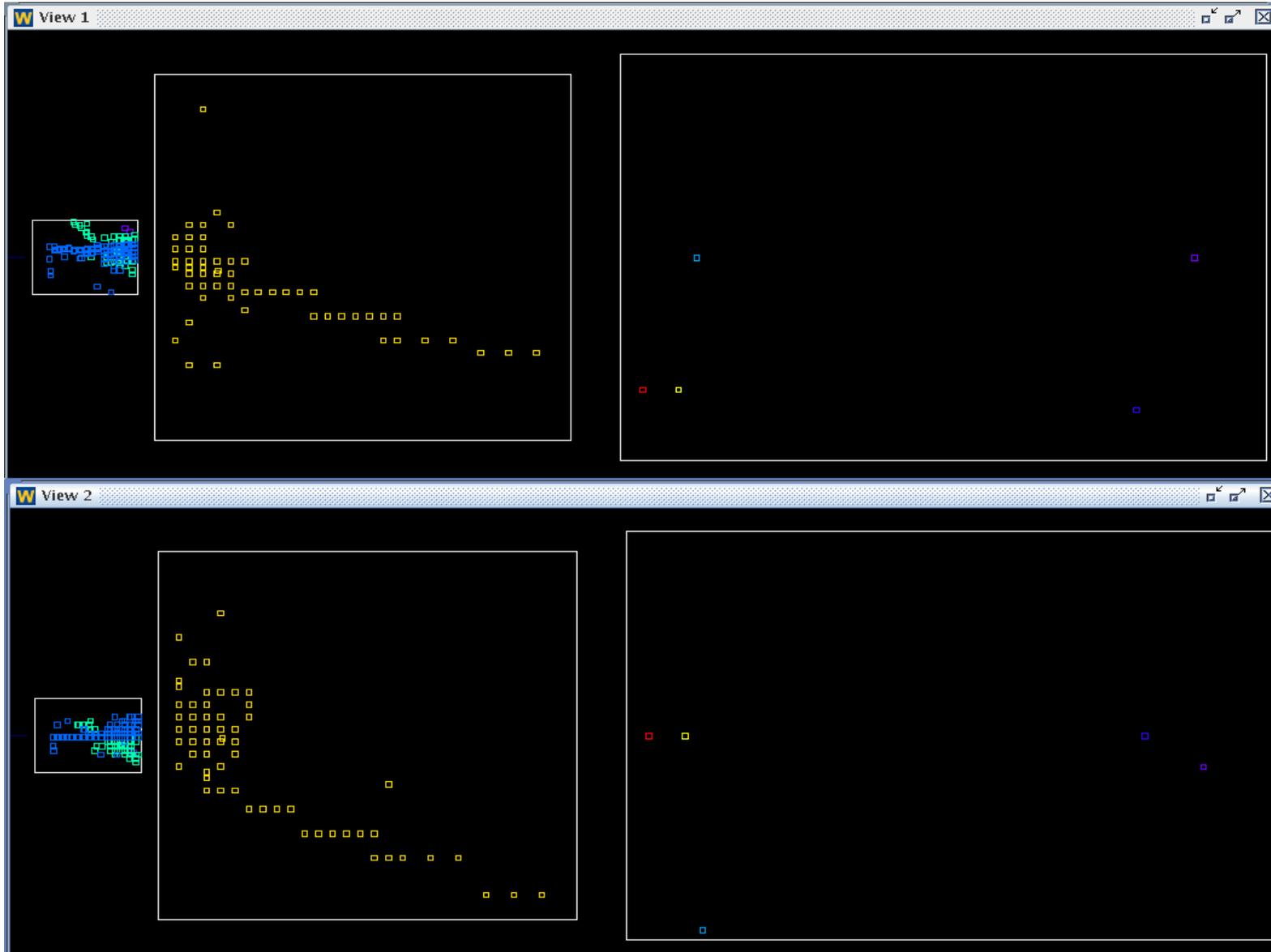
- density neighborhood (fixed, used to find hit densities D_i)
- clustering neighborhood (adaptive, based on hit's density)
- density gradient for cells i,j (j in the neighborhood of i)
-->hit-density difference divided by distance d_{ij} :

$$D_{ij} = (D_j - D_i)/d_{ij}$$

- each cell attaches itself to the hit j with maximum hit-density gradient in its clustering neighborhood
- Cells with local density maxima become cluster seeds
- Optimization consists mostly in finding appropriate neighborhoods (typically 8x4x4 for EM clusters in full-detector SiD models)



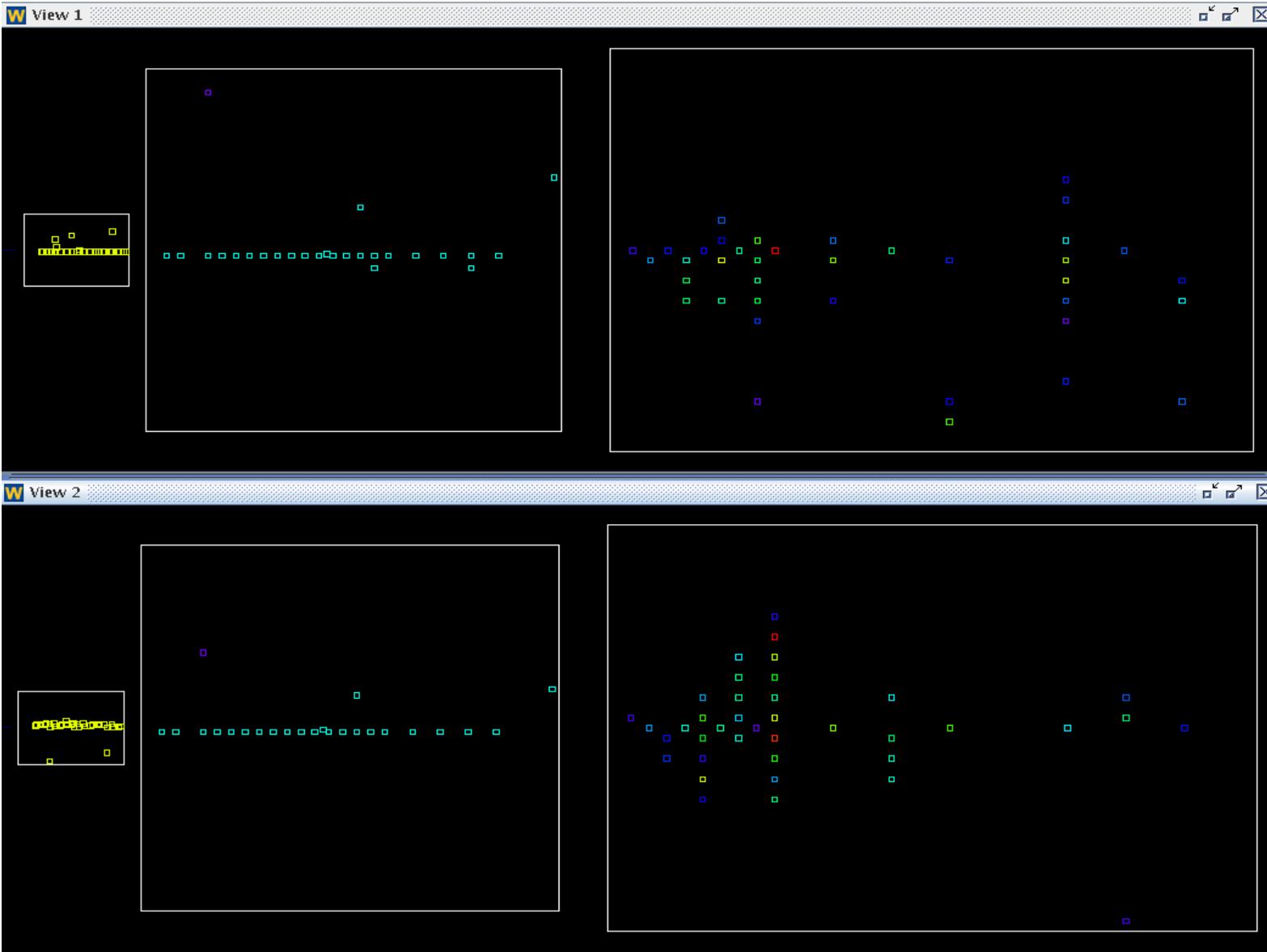
Directed tree clustering algorithm



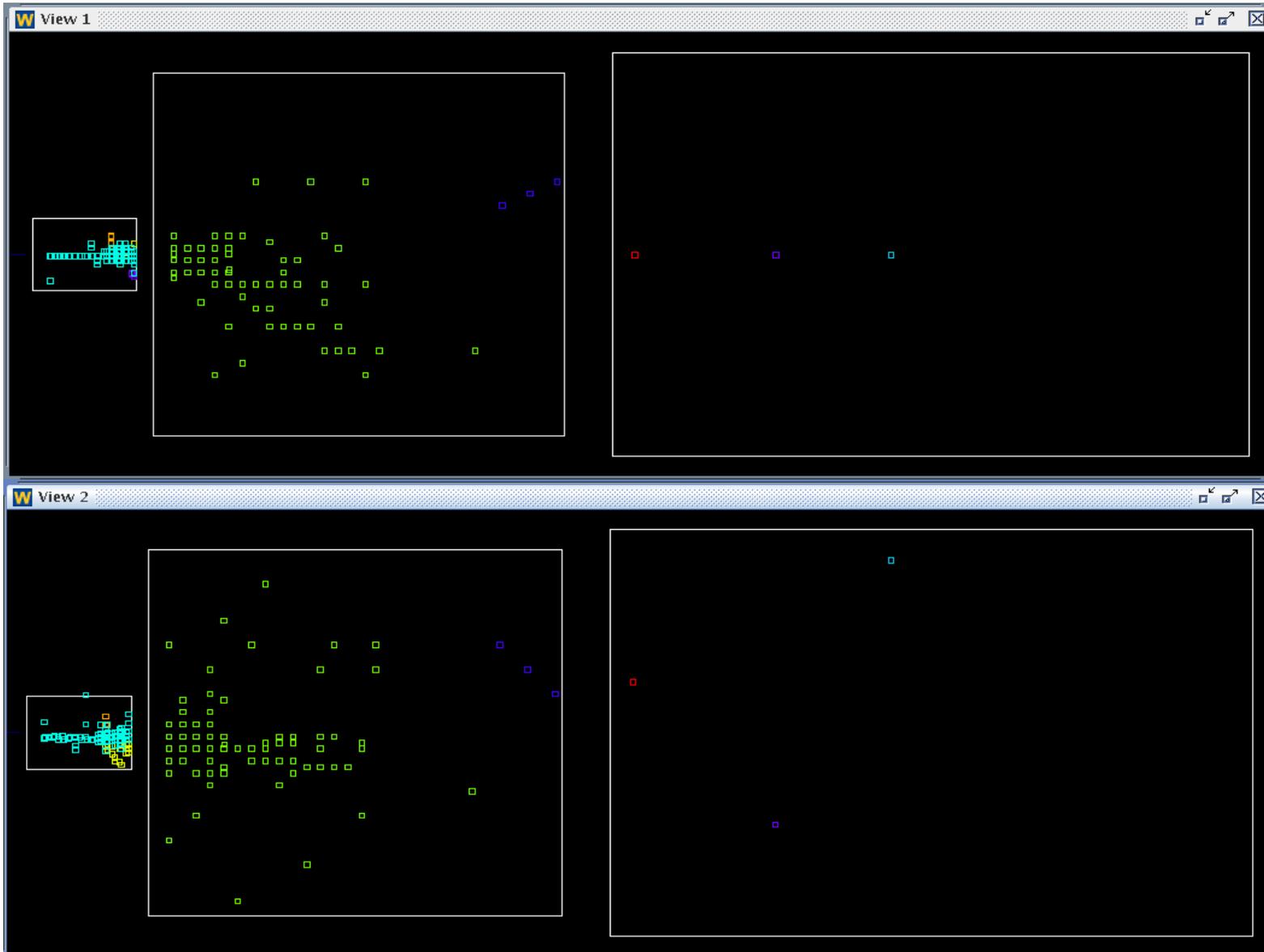
- Run 300620, evt 615769: a 20 GeV pion
- Sizes of neighborhood windows need to be optimized
- Tcmt not used for clustering

Directed tree clustering algorithm

- Run 300620, evt 615775: a 20 GeV pion
- Sizes of neighborhood windows need to be optimized
- Tcmt **not used** for clustering

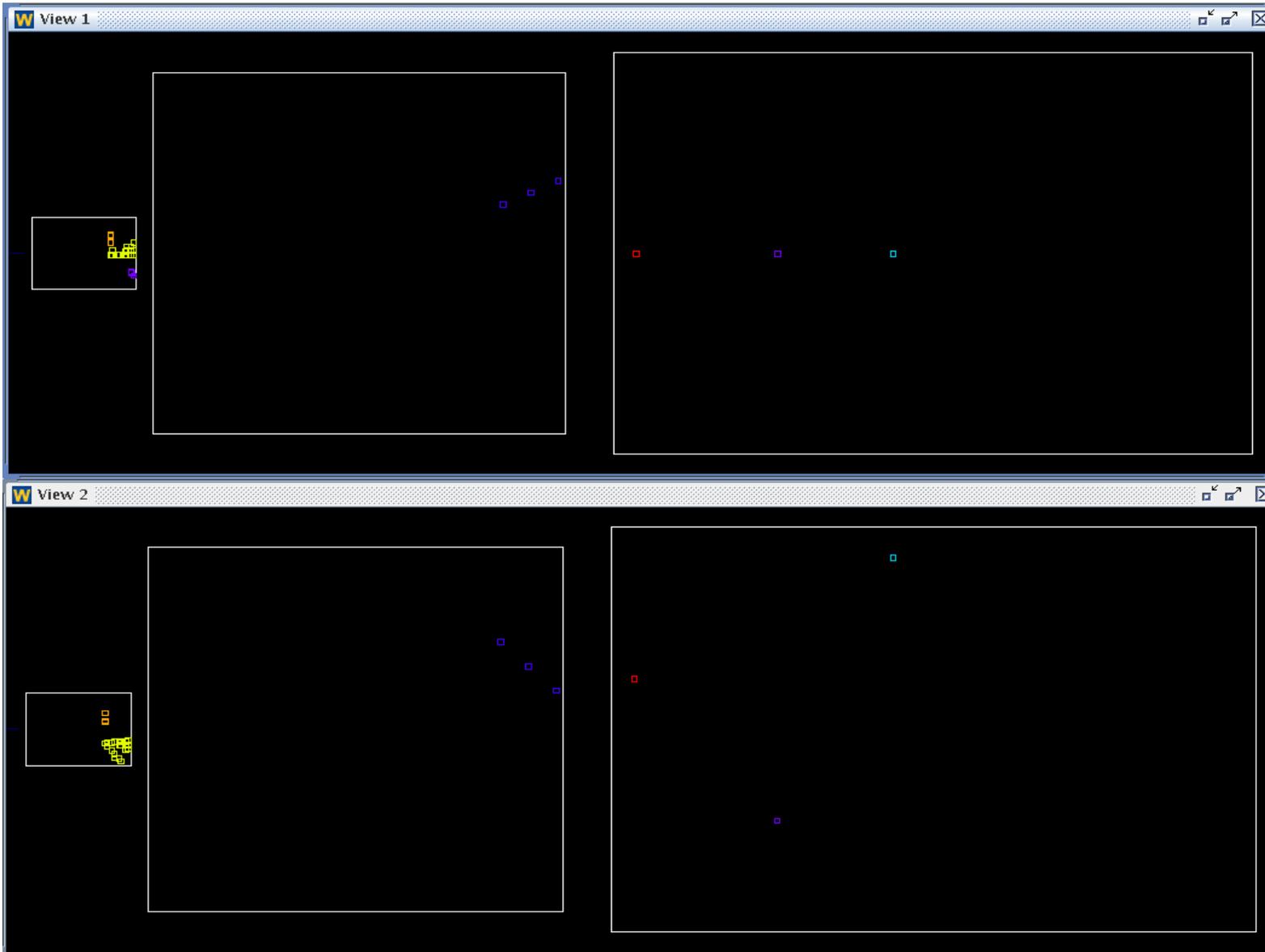


Directed tree clustering algorithm



- Run 300620:
a 20 GeV pion
- Clusters can be
turned off
independently
(see next page)

Directed tree clustering algorithm

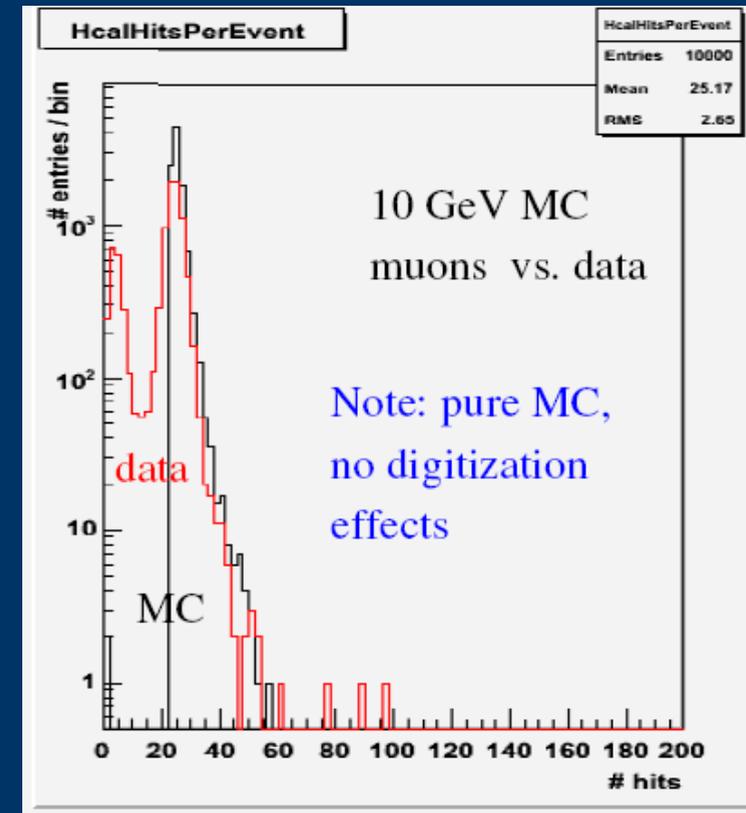


- Run 300620:
a 20 GeV pion
- Clusters can be
turned off
independently
(see previous
page)

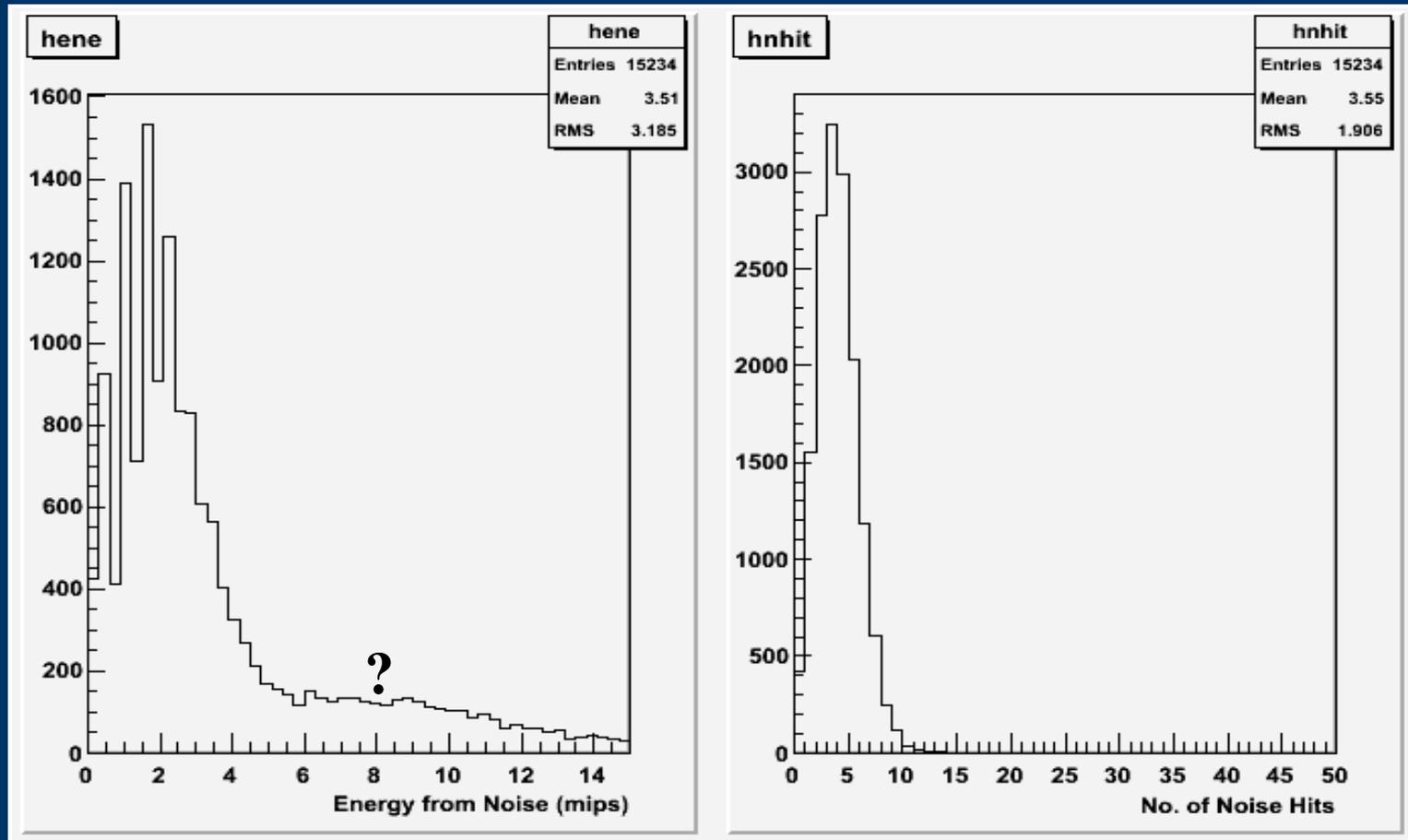
Noise studies using pedestal events

by Vishnu Zutshi

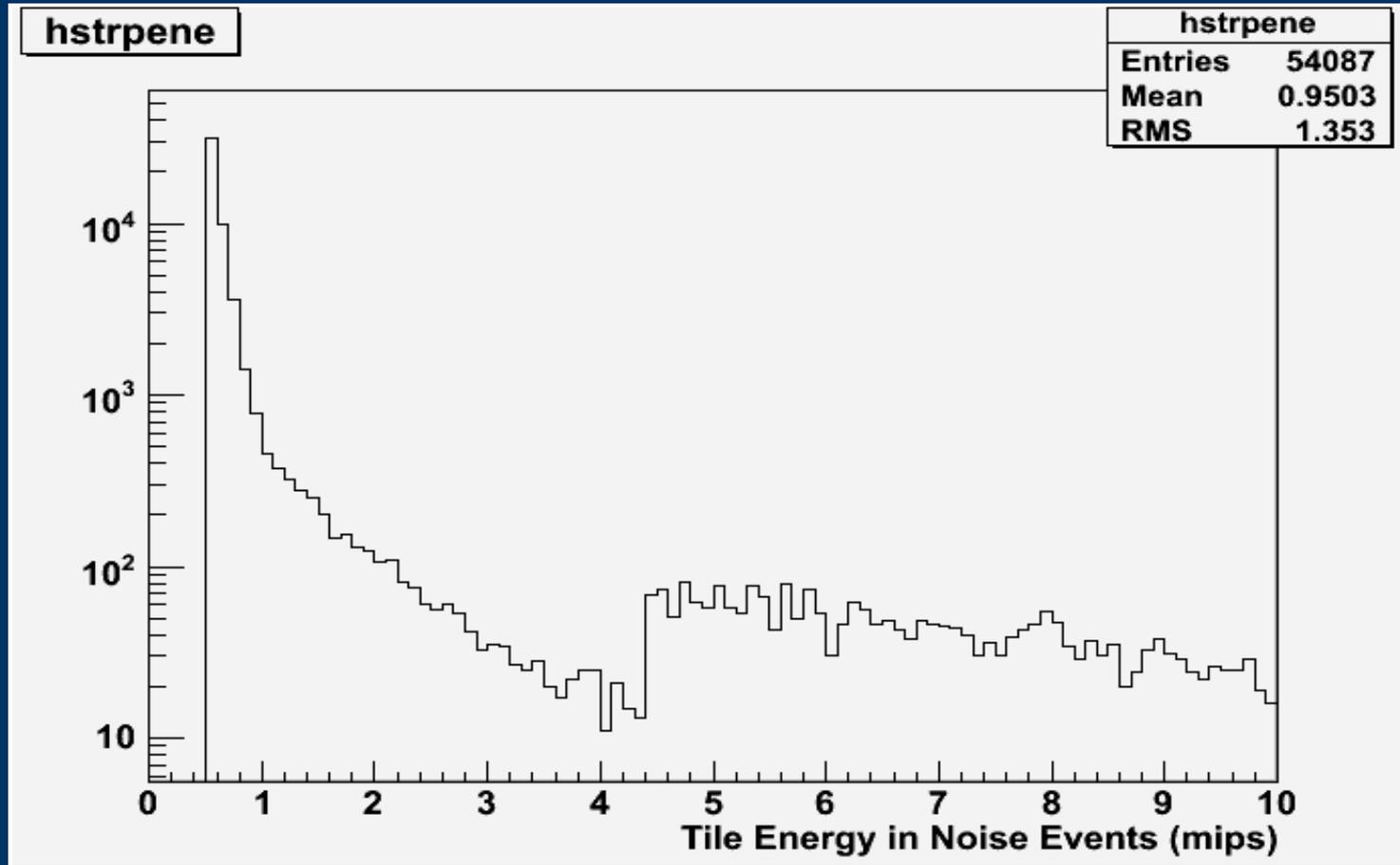
- Motivation: combined analysis presented at LCWS'07 showed some weakness in the MC vs. data comparisons: noise handling is needed!



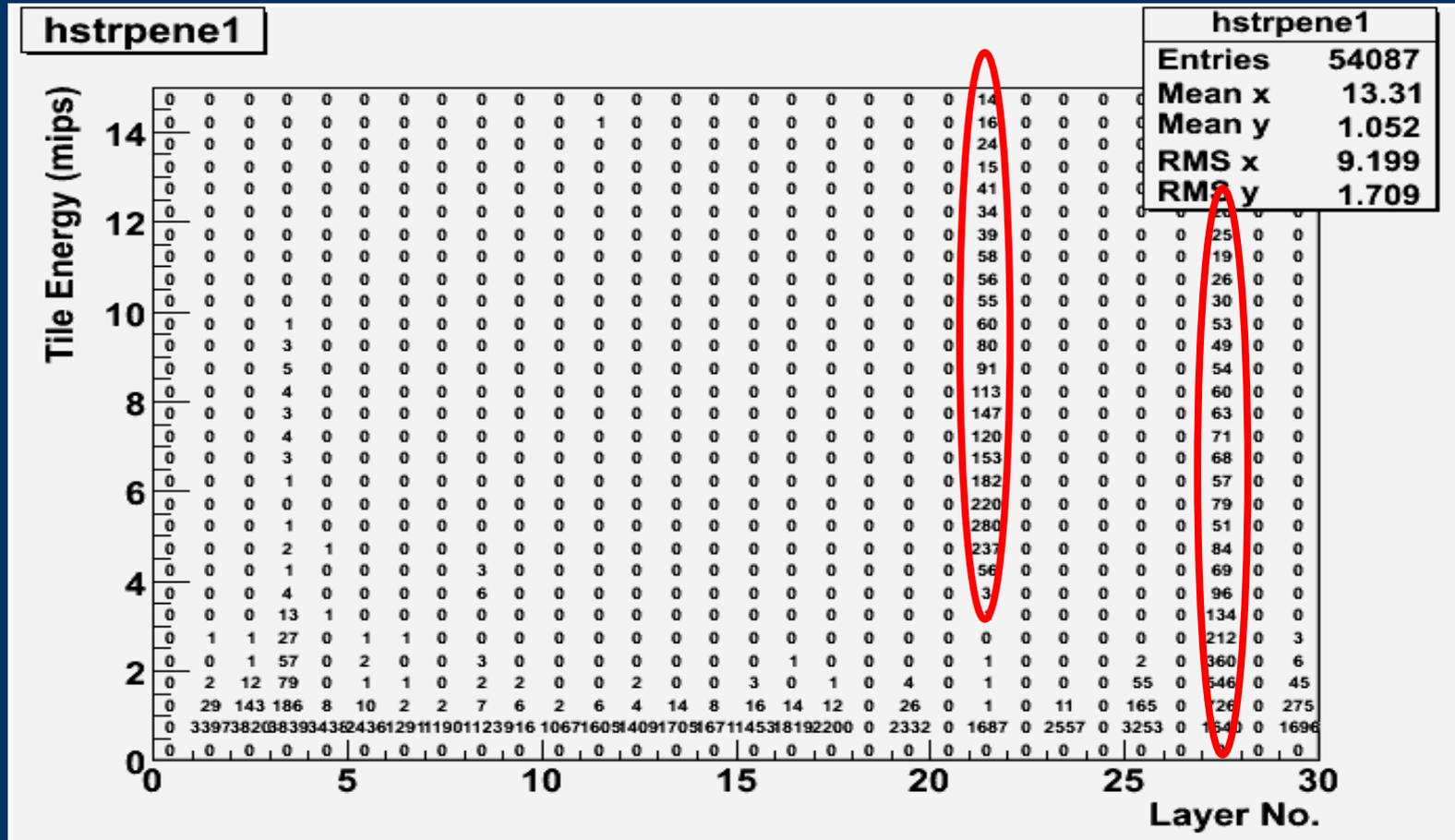
HCAL (Oct. 06)



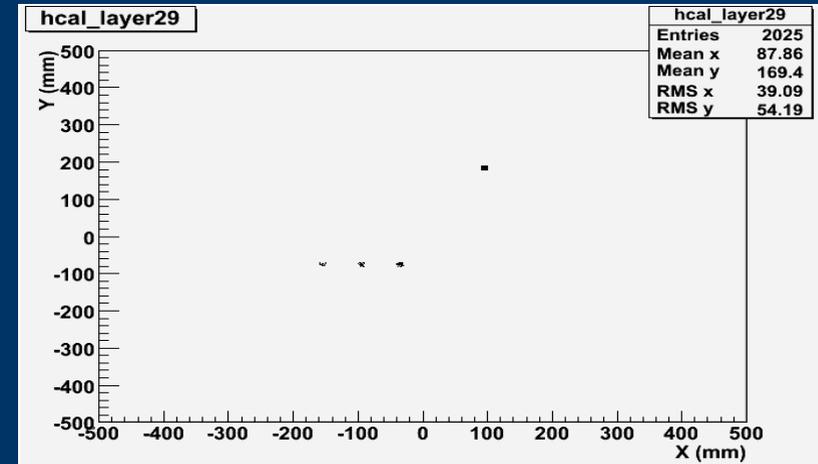
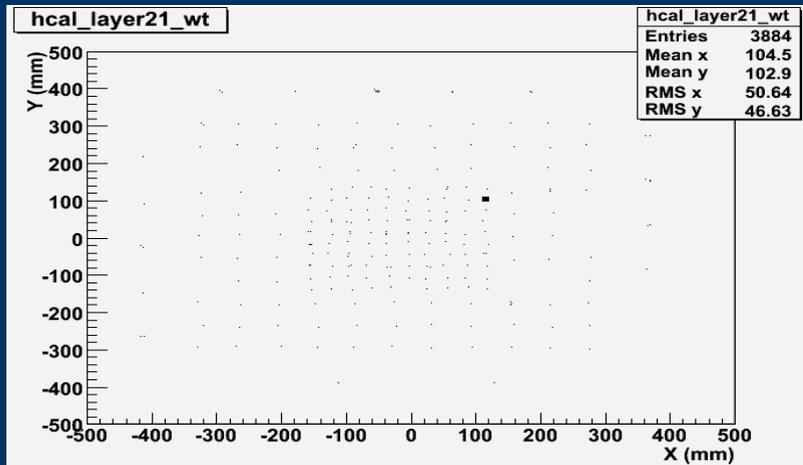
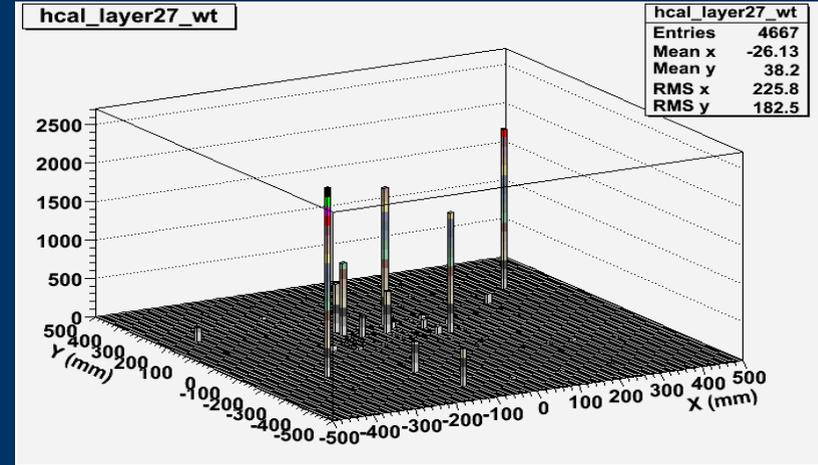
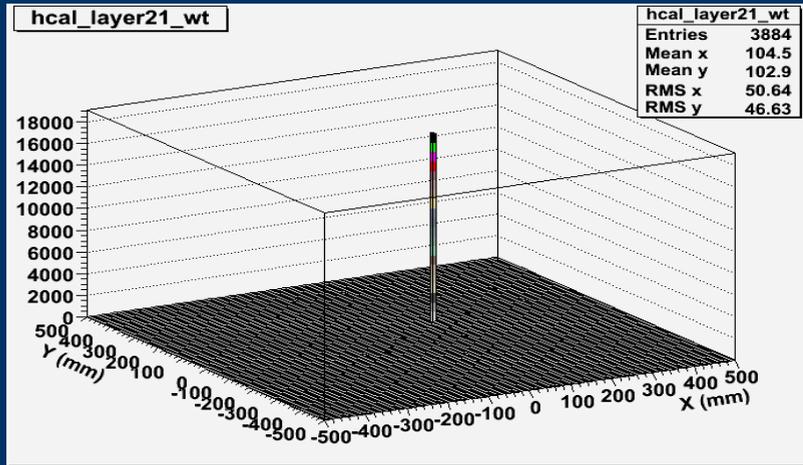
HCAL Tile Energy Spectrum



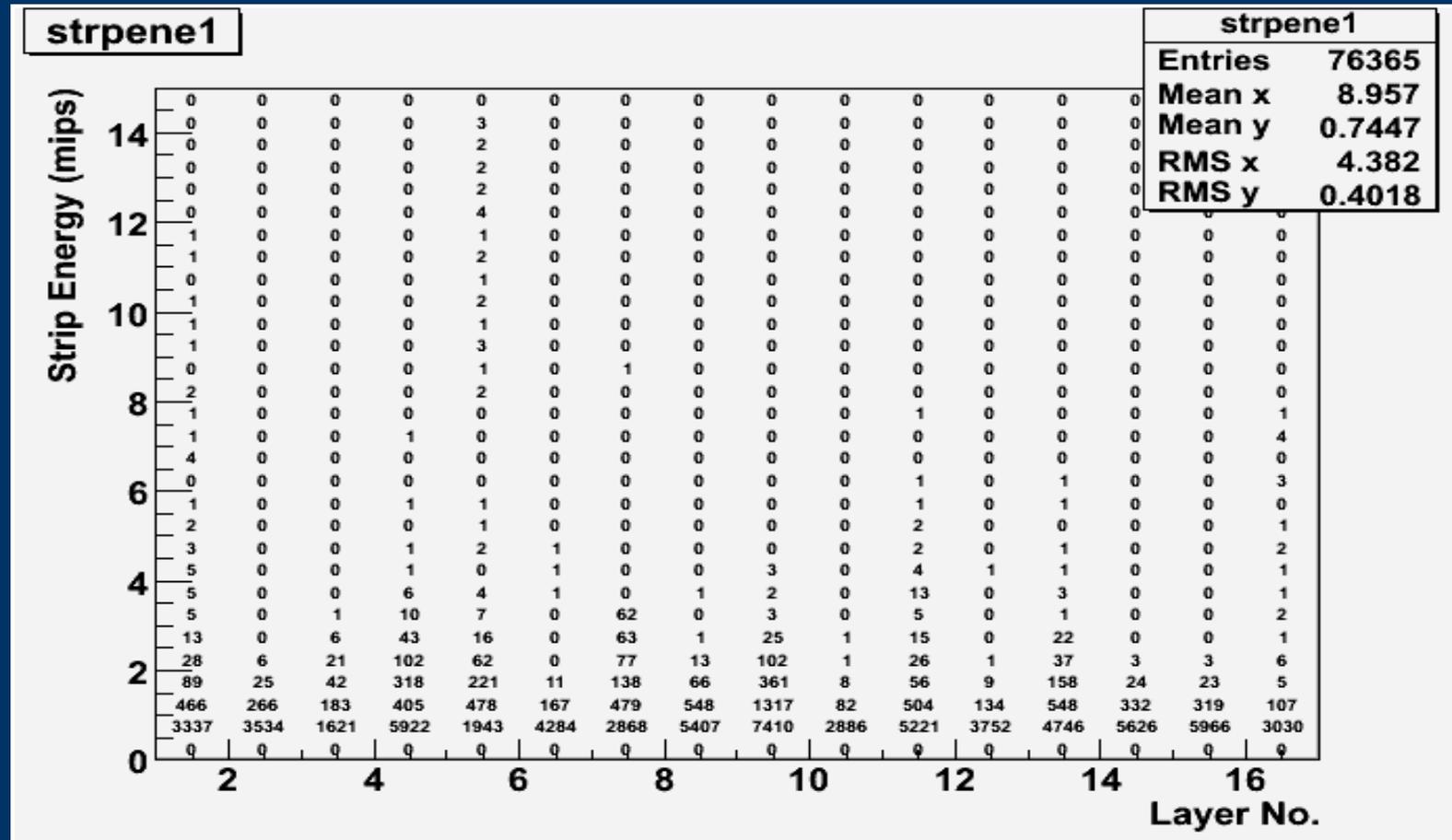
HCAL Energy Spectrum vs Layer



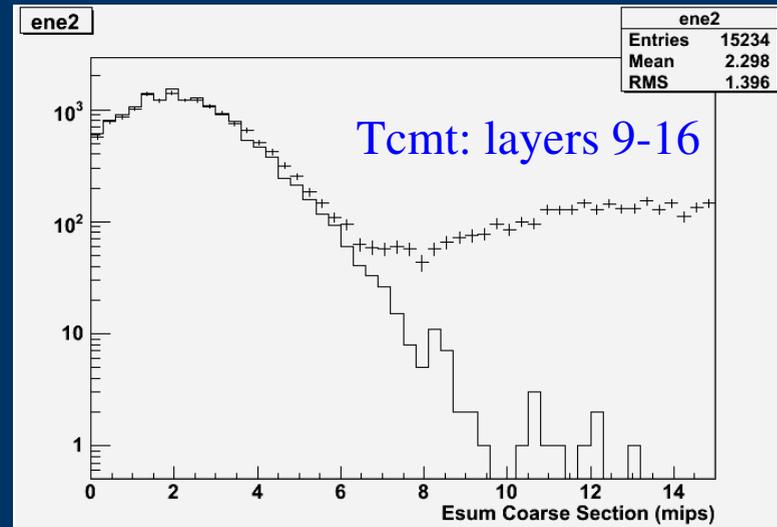
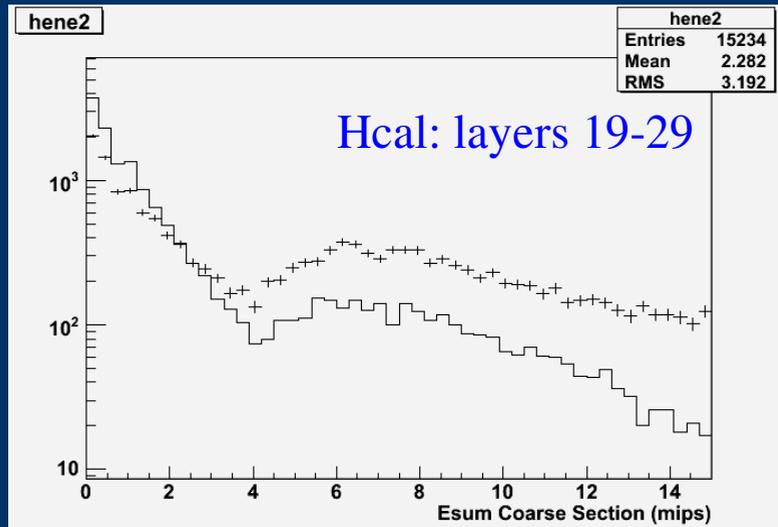
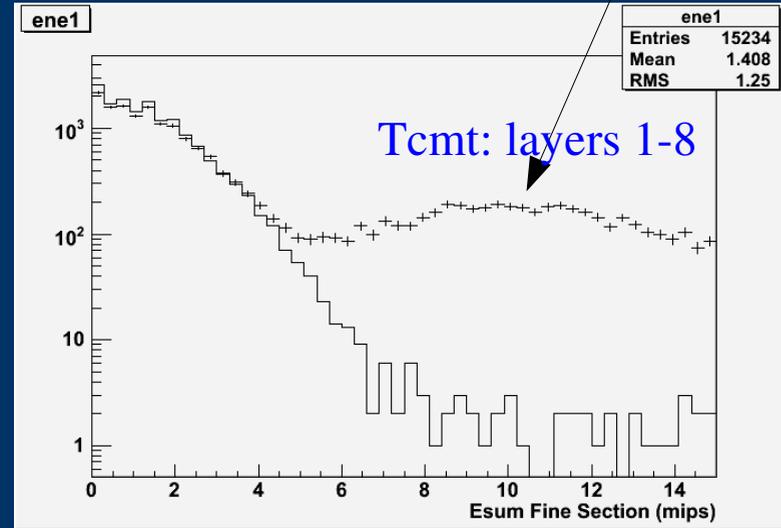
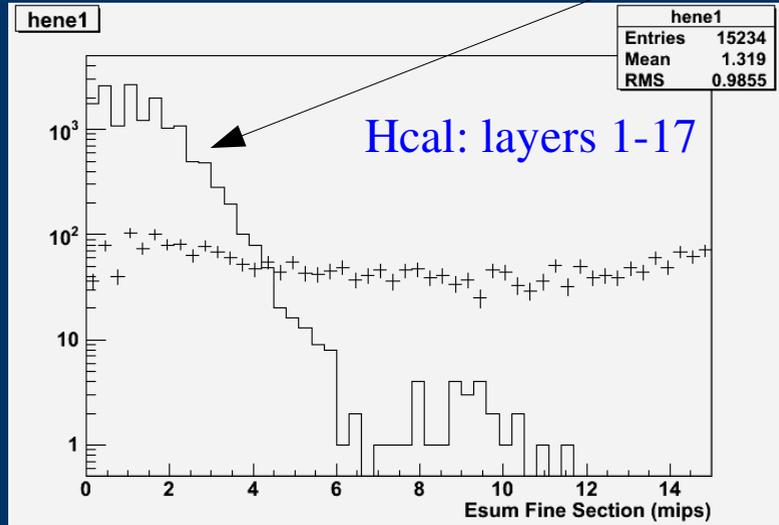
Layer occupancy (energy-weighted)



TCMT Energy Spectrum vs Layer



Energy Sums: pedestals vs. 6 GeV pions



Summary

- Mokka updates to TCMT geometry drivers (staggering) (done)
- Updates to JAS3 event display (TCMT hits are strips rather than dots)
- Directed tree clustering on data
 - C++: requires port of directed tree clustering algorithm (no neighbor-finding utility)
 - Java: requires compact description for Calice TB setup (optimizing for TB?)
- Merging MC + pedestal events (procedure from Sebastian)
- Data analysis: MC vs. data agreement (for ALCPG'07 @ Fermilab ?)